

Mount St. Helens— A Story of Succession

On May 18, 1980, the Mount St. Helens volcano in Washington State exploded violently after two months of intense earthquake activity and intermittent weak eruptions, causing the worst volcanic disaster in the recorded history of the United States. This cataclysmic eruption and related events rank among the most significant geologic events in the United States during the 20th century.



Mount St. Helens, May 17, 1980, one day before the devastating eruption. The view is from Johnston's Ridge, six miles (10 kilometers) northwest of the volcano. Photo taken May 17, 1980, by Harry Glicken, USGS.



Mount St. Helens, soon after the May 18, 1980 eruption, as viewed from Johnston's Ridge. Photo taken September 10, 1980, by Harry Glicken, USGS.

During the eruption, a 300-mile-an-hour lateral blast of hot air and debris flattened the surrounding old-growth forest. A cloud of ash climbed to 80,000 feet in 15 minutes and circled the globe in 15 days. All told, the eruption blasted more than 230 square miles of forests, lakes, meadows, and streams.

Virginia Dale was in the first helicopter-load of ecologists to land at Mount St. Helens after it erupted. "I just remember how bizarre it was going out into that landscape," she says of the suddenly

gray, ash-covered terrain. "It gave the impression of total lifelessness." Dale studies ecological succession, or how an environment recovers after a major disturbance. She jokingly calls herself a "disturbed ecologist." When it comes to studying devastation, she says, "Mount St. Helens was off the scale."

Although areas in the blast zone around Mount St. Helens appeared barren and lifeless after the 1980 eruption, some plants and animals did survive. Pocket gophers in underground burrows, fish in ice covered lakes, and salamanders hibernating in mud were protected from the hot, stone-filled wind of the blast. Plants such as willow, vine maple, and black cottonwood were able to re-sprout from roots protected in moist soil. Those plants are called survivors, and they were very important to the re-initiation of plants on the barren landscape. Some snow-protected Pacific silver fir and mountain hemlock trees also survived. They served as important sources of seed for establishing the future forest inside the blast zone at Mount St. Helens.



Redback salamander. Photo by David Cappaert, Michigan State University.



Vine maple. Photo by Chris Evans, River to River CWMA.



Mountain hemlock. Photo by Donald Owen, California Department of Forestry and Fire Protection.

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Despite surviving the eruption, many of those plants and animals were unable to live in the harsh new environment. But some were able to tolerate the extreme conditions and helped to pave the way for new colonizers. Winds brought light seeds and insects to the area, enabling them to enter the area and become established. Plants and insects attracted birds, deer, and elk from nearby areas. Heavier seeds “hitchhiked” on the feathers of birds and in elk droppings. Ponds and springs created by the eruption became the centers of life for survivors and colonizers.

Today, many areas around the volcano still have a desert-like appearance, but the vast majority of plant and animal species that were found at Mount St. Helens before the 1980 eruption have returned. Some, like the Roosevelt elk, have returned in numbers that far exceed pre-1980 populations.



Roosevelt elk. Photo by Terry L. Spivey, Terry Spivey Photography.

In the blast zone, the establishment of plants was slow for the first few years following the eruption. Three years after the eruption, the average plant coverage on research plots was only 1 percent. Fourteen years after the eruption, plant coverage on those plots was up to 38 percent. Twenty years after the eruption, plant coverage was approximately 66 percent.

Wind played a key role in initiating early-succession processes by blowing in spiders, insects, and seeds from nearby undisturbed areas. One plant found early on is the pearly everlasting. This plant has lightweight seeds that were easily carried by wind.

Prairie lupine, a purple-blue wildflower, was also one of the first plants to grow on the barren land. Charlie Crisafulli, a research ecologist, arrived at Mount St. Helens when he was 22 years old. He and another ecologist were the first to spot a lone lupine plant.



Perennial lupine. Photo by Catherine Herms, The Ohio State University.

Lupines do not usually colonize the middle of an empty landscape. The deep volcanic ash where he found the lupine held few nutrients. But lupines, like other plants in the pea family, are able to “fix” nitrogen, thus enriching the soil. Each lupine plant created a microhabitat that was hospitable to several other plant species. Besides enriching the soil with nitrogen, the lupines also physically trapped windblown debris and attracted insects. As the insects died on or around the plant, they enriched the soil with organic matter.

Within a few years, the lupine patches became biological hotspots facilitating the growth of other plant species and attracting numerous insects, birds, and small mammals. The flourishing of life on the Pumice Plain of Mount St. Helens today may have begun with that lone lupine. Crisafulli said that it was the lupine wildflowers that taught him one of the key lessons of succession: the importance of chance.

For the next 30 years, Crisafulli observed the development of ecological relationships across the volcanic landscape. He saw that a log carried downstream in a mudflow may transport nutrients, microbes, fungi, and even small animals to an area devoid of organisms. He also observed that whole

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plants may regenerate from root fragments that are carried downstream and deposited along river margins. Those remnants of the old landscape came to be known as “biological legacies,” and their influence on the new landscape was significant. They serve as source populations for species to recolonize the disturbed area.

Research conducted by scientists at Mount St. Helens has advanced our understanding of how to manage an area after a disturbance. For example, the biological legacies mentioned earlier were found to strongly influence the plant and animal communities that developed after the eruption. This discovery has led to revised thinking about how trees should be harvested. The importance of leaving some live and dead trees within areas being harvested is now well understood.

Understory herbs, shrubs, and saplings of shade-tolerant trees from the previous old-growth forest survived the blast in numerous scattered patches under a protective cover of snow. Now 15 to 25 feet tall, late-successional species such as Pacific silver fir and mountain hemlock, and shorter stature big huckleberry and vine maple grow intermixed with sun-loving early colonizers such as lupine, fireweed, and pearly everlasting. Such observations have furthered our understanding of succession.



Pearly everlasting. Photo by Mary Ellen (Mel) Harte.

Fireweed. Photo by Dave Powell, USDA Forest Service.

As red alder trees and lupines became established, they influenced succession. Because alder can also fix nitrogen, they improve the fertility of the soil like the lupine plant. Also, the rapidly growing alder trees created shade and added organic material

to the ground surface. This contribution allowed shade-tolerant plant species to become established. Thirty years after the eruption, red alder is a dominant tree.



Red alder. Brian Lockhart, USDA Forest Service.

Despite the establishment of vegetation over the past 30 years, scientists predict that it will likely take several hundred years for the blast area to look the way it did before the eruption. Before the eruption, the forest canopy was dominated by old-growth Douglas fir, western and mountain hemlock, and Pacific silver fir, with many species of moss, lichens, herbs, and shrubs in the understory. Scientists will continue to study the blast area and to document the return of plant and animal communities for many years to come.

Sources

Dale, Virginia, Frederick J. Swanson, and Charles M. Crisafulli, eds. 2005. “Ecological Responses to the 1980 Eruption of Mount St. Helens.” http://www.fs.fed.us/pnw/pubs/journals/pnw_2005_dale003.pdf.

Mazza, Rhonda. 2010. “Mount St. Helens 30 Years Later: A Landscape Reconfigured.” *Science Update*, Issue #19. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. <http://www.fs.fed.us/pnw/pubs/science-update-19.pdf>.

USDA Forest Service. 2010. “Volcano Review 2010.” <http://www.fs.fed.us/gpnf/mshnvm/volcano-review/life-springs-eternal.shtml>.

U.S. Geological Survey, Cascades Volcano Observatory. 2010. “Mount St. Helens 30th Anniversary.” <http://vulcan.wr.usgs.gov/Volcanoes/MSH/30Years/framework.html>.

Williams, David B. 2005. “Rising from the Ashes.” *Smithsonian*. http://www.smithsonianmag.com/history-archaeology/Rising_from_the_Ashes.html.

Mount St. Helens— A Story of Succession Questions

1. Did any plants survive the eruption? If so, how did they survive?
2. What is the name for plants that survive a major disturbance? What was their role in regenerating the disturbed area?
3. How was the prairie lupine important to the growth of plants on the barren land found after the eruption?
4. What roles did factors such as wind, moisture, and landforms play in succession after the eruption?
5. What roles did factors such as plant and animal interactions play in succession after the eruption?
6. According to your reading of the story, what do you think a “colonizer” is?
7. How has the red alder tree influenced succession?
8. What do you predict will happen in the blast zone over time?
9. What might change your prediction?